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Abstract

Pellet size (i.e., 3/32 in., 5/32 in., 5/16 in., and 1/2 in. diameter) had little effect on growth performance during the early stages (d 0 to 5) of the nursery phase. However, the 5/32 in. diameter pellets supported the best efficiencies of gain during the overall nursery (d Â°to 29) and finishing phases.; Swine Day, Manhattan, KS, November 21, 1996

Keywords

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INFLUENCE OF PELLET SIZE ON GROWTH PERFORMANCE IN NURSERY PIGS AND GROWTH PERFORMANCE, NUTRIENT DIGESTIBILITY, AND STOMACH MORPHOLOGY IN FINISHING PIGS

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Summary

Pellet size (i.e., 3/32 in., 5/32 in., 5/16 in., and 1/2 in. diameter) had little effect on growth performance during the early stages (d 0 to 5) of the nursery phase. However, the 5/32 in. diameter pellets supported the best efficiencies of gain during the overall nursery (d 0 to 29) and finishing phases.

(Key Words: Nursery Pigs, Finishing Pigs, Pellet Size, Growth.)

Introduction

Nutritionists and feed manufacturers have suggested that pigs need various pellet sizes as age and weight increase. However, the very few experiments designed to evaluate the effects of pellet size show little consensus about its effects. From a feed manufacturer's perspective, having multiple dies is expensive. Also, constant changing of dies takes time and labor, and the smaller the die openings, the lower the production rate.

Thus, we designed two experiments to determine the effects of pellet size (diameter) on growth performance in nursery pigs and growth performance, nutrient digestibility, carcass measurements, and stomach morphology in finishing pigs.

Procedures

A total of 210 weanling pigs (initial wt of 11.8 lb) was sorted by sex and ancestry and blocked by weight to pens. Each treatment had seven pigs per pen (4 ft × 5 ft) and six pens. The experimental diets (Table 1) were fed in three phases (d 0 to 5, 5 to 15, and 15 to 29). Treatments were a meal control and 3/32 in., 5/32 in., 5/16 in., and 1/2 in. pellets. The pigs were housed in an environmentally controlled nursery room with ad libitum access to feed and water. Pigs and feeders were weighed on d 0, 5, 15, and 29 to allow calculation of ADG, ADFI, and F/G.

All data were analyzed as a randomized complete block design with pen as the experimental unit. Polynomial regression was used to characterize the shape of the response to pellet size.

In the second experiment, 80 barrows (average initial wt of 127 lb) were sorted by ancestry, blocked by weight, and allocated to pens (5 ft × 5 ft). Each treatment had two pigs per pen and eight pens. Treatments were the same used in the nursery experiment. Pigs were fed the experimental diets (Table 1) in two phases (from 127 to 194 lb and from 194 lb to slaughter wt).

The pigs were housed in an environmentally controlled finishing facility and allowed ad libitum access to feed and water. The pigs and feeders were weighed at initiation, midpoint, and conclusion of the growth assay to allow calculation of ADG, ADFI, and F/G. When the pigs in the heaviest pen of a weight block averaged 260 lb, the entire block was slaughtered at a commercial packing plant. Hot carcass weight and last rib backfat thickness were recorded immediately after slaughter. In addition to standard

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carcass measurements, stomachs were collected and scored for severity of keratinization and ulceration.. The scoring system for keratinization was: 0 = normal; 1 = mild keratosis; 2 = moderate keratosis; and 3 = severe keratosis. The scoring system for ulcers was: 0 = normal; 1 = slight erosions; 2 = ulcers; and 3 = severe ulcers

Carcass measurements were adjusted with final weight as a covariate. All data were analyzed as a randomized complete block design with pen as the experimental unit. Polynomial regression was used to characterize the response to pellet size.

Results and Discussion

For d 0 to 5 of the nursery experiment (Table 2), pigs fed pellets had 27% greater ADG ($P<.04$) and 29% better F/G ($P<.001$) than those fed the meal control. However, pellet size did not affect rate ($P>.41$) or efficiency ($P>.20$) of gain. For d 0 to 15, pelleting improved F/G by 13% ($P<.004$). There was a trend for improved F/G (cubic effect; $P<.09$) as pellet size was increased from 3/32 in. to 5/32 in., but, F/G worsened as pellet size was increased beyond 5/32 in. For the overall period d 0 to 29, pelleting improved ($P<.03$) efficiency of gain by 3%. As pellet size was increased from 3/32 in. to 5/32 in. the pigs consumed less fed and had better F/G (1.43 vs 1.39). However, as pellet size was increased further (beyond 5/32 in.) feed consumption tended to increase ($P<.08$) and F/G worsened (cubic effect; $P<.04$).

For the finishing experiment (Table 3), pigs fed pellets had 4% better F/G ($P<.08$) than those pigs fed the meal diets. As pellet size was increased from 3/32 in. to 1/2 in., pigs gained weight faster ($P<.004$), consumed more feed ($P<.001$), and tended ($P<.07$) to have poorer F/G. Dressing percentage and last rib fat depth were not influenced ($P>.47$) by dietary treatments.

Digestibility of DM and N were increased ($P<.001$) by 5 and 9%, respectively, by feeding pellets vs a meal diet. However, no differences ($P>.22$) occurred in digestibility of DM or N among the pellet size treatments.

Stomach keratinization tended ($P<.08$) to be lower and stomach ulceration was lower ($P<.003$) for pigs fed the meal diets as compared to the pelleted diets. As pellet size was increased from 3/32 in. to 1/2 in., severity of ulceration decreased ($P<.04$). However, it is important to note that all scores for keratosis and ulcers were low (i.e., mild to slight categories).

In conclusion, these data suggest that pellet size had little effect on growth performance during the early nursery stage. However, pigs fed the 5/32 in. pellets had the best efficiencies of gain in both the overall nursery and finishing phases.

Table 1. Composition of Diets

Ingredient, %	Nursery Experiment			Finishing Experiment	
	d 0 to 5[a]	d 5 to 15[b]	d 15 to 29[c]	127 to 194 lb[d]	194 lb to market[e]
Corn	28.37	43.59	59.15	78.52	83.91
Soybean meal	24.95	27.67	33.48	17.79	12.34
Soybean oil	2.00	2.00	3.00	1.00	1.00
Monocalcium phosphate	1.83	1.62	1.51	1.02	.88
Limestone	.65	.73	.90	.92	.92
Salt	.10	.20	.30	.30	.30
Lysine-HCl	.25	.15	.15	.15	.15
Whey powder	20.00	20.00	--	--	--
Lactose	10.00	--	--	--	--
Porcine plasma protein	4.00	--	--	--	--
Wheat gluten	4.00	--	--	--	--
Blood meal	2.00	2.00	--	--	--
Vit/Min/AA/Ab[f]	1.85	1.84	1.51	.30	.30
Chromic oxide[g]	--	--	--	--	.20
Total	100.00	100.00	100.00	100.00	100.00

[a]Formulated to 1.7% lysine, .9 % Ca, .8 % P, and 1.49 Mcal of ME/lb.
[b]Formulated to 1.45% lysine, .9 % Ca, .8 % P, and 1.49 Mcal of ME/lb.
[c]Formulated to 1.3% lysine, .8 % Ca, .7 % P, and 1.56 Mcal of ME/lb.
[d]Formulated to .85 % lysine, .65 % Ca, .55 % P, and 1.52 Mcal of ME/lb.
[e]Formulated to .7 % lysine, .6 % Ca, .5 % P, and 1.52 Mcal of ME/lb.
[f]Provided 150 g/ton of apramycin for d 0 to 15, 50 g/ton of carbadox for d 15 to 29, and 40 g/ton of tylosin for the finishing experiment.
[g]Used as an indigestible marker.

Table 2. Effects of Pellet Size on Growth Performance in Nursery Pigs[a]

Item	Meal	Pellet Diameter, in				CV	Probability, $P<$			
		3/32	5/32	5/16	1/2		M vs P	Lin	Quad	Cub
d 0 to 5										
ADG, lb	.27	.33	.33	.36	.35	20.5	.04	-[b]	-	-
ADFI, lb	.34	.29	.29	.36	.31	19.1	-	-	-	-
F/G	1.26	.88	.88	1.00	.89	14.3	.001	-	-	-
d 0 to 15										
ADG, lb	.57	.61	.62	.58	.59	10.1	-	-	-	-
ADFI, lb	.84	.75	.75	.81	.78	6.7	.01	.14	-	.10
F/G	1.48	1.23	1.21	1.40	1.32	9.9	.004	.10	-	.09
d 0 to 29										
ADG, lb	.79	.80	.82	.80	.80	5.0	-	-	-	-
ADFI, lb	1.18	1.12	1.14	1.19	1.17	5.0	-	.08	-	-
F/G	1.49	1.43	1.39	1.49	1.46	4.2	.03	.05	-	.04

[a]A total of 210 weanling pigs (seven pigs per pen and six pens per treatment) with an avg initial wt of 11.8 lb.
[b]Dashes indicate $P>.15$.

Table 3. Effects of Pellet Size on Growth Performance, Nutrient Digestibility, Carcass Characteristics, and Stomach Morphology in Finishing Pigs[a]

		Pellet Diameter, in					Probability, $P<$			
Item	Meal	3/32	5/32	5/16	1/2	CV	M vs P	Lin	Quad	Cub
ADG, lb	2.27	2.08	2.22	2.24	2.30	6.2	-[b]	.004	-	-
ADFI, lb	6.64	5.76	6.09	6.29	6.72	6.8	.02	.001	-	-
F/G	2.93	2.78	2.74	2.81	2.91	5.6	.08	.07	-	-
Dressing percentage	72.4	72.4	72.5	72.5	72.1	1.3	-	-	-	-
LRFD, in	.97	.91	.91	.93	.92	11.6	-	-	-	-
Apparent digestibility (d 38), %										
DM	85.0	89.5	89.7	90.1	89.3	1.7	.001	-	-	-
N	78.8	85.0	85.7	87.1	85.0	3.8	.001	-	-	-
Stomach keratinization										
Total observations	16	16	15	16	16					
Normal	5	1	2	3	3					
Mild	6	6	7	4	8					
Moderate	4	9	4	7	3					
Severe	1	0	2	2	2					
Mean score[c]	1.22	1.75	1.60	1.69	1.50	49.5	.08	-	-	-
Stomach ulceration										
Total observations	16	16	15	16	16					
Normal	14	6	5	8	11					
Erosions	2	4	6	2	4					
Ulcerations	0	6	2	4	1					
Severe ulcers	0	0	2	2	0					
Mean score[f]	.19	1.19	1.10	1.09	.50	112.4	.003	.05	-	-

[a]A total of 80 barrows (two pigs per pen and eight pens per treatment) with an avg initial wt of 127 lb and an avg final wt of 248 lb.
[b]Dashes indicate $P>.15$.
[c]Scoring system was: 0 = normal; 1 = mild keratosis; 2 = moderate keratosis; and 3 = severe keratosis.
[d]Scoring system was: 0 = normal; 1 = slight erosions; 2 = ulcers; and 3 = severe ulcers.
[e]Cochran-Mantel-Haenszel statistic, row mean scores differ test was $P>.36$.
[f]Cochran-Mantel-Haenszel statistic, row mean scores differ test was $P<.003$.